

and the nervures were enclosed between the two epidermal laminae; but the leaves are especially distinguished by the extreme abundance of gummous ducts. These ducts, of which the true structure is not yet determined, accompany and surround the vascular bundles; in many cases these organs carbonized form filaments substituted, so to speak, for the true nervures, which they conceal while indicating their direction. This character occurs, though in a less degree, in the leaves of the Cordaïteæ.

The leaves of the Dolerophylleæ must have produced on the stems which bore them rounded or transversely ellipsoidal insertion-scars. Such scars occur on the surface of many of the stems hitherto placed under the Calamodendreae, and the leaves of which are unknown.

The reproductive organs, discovered by M. Renault and ascribed by him to the Dolerophylleæ, are very singular at the first glance; but while they depart from what we are accustomed to see in the Phanerogamia, they attest the existence of a category of plants in which fecundation took place by the agency of corpuscles differing but little, notwithstanding their considerable dimensions and complicated structure, from the grains of pollen observed in the micro-pyle or in the pollinic chamber of several Palæozoic Gymnosperms.

Thus the Dolerophylleæ will represent, in the midst of a primitive vegetation, in which the Cryptogamia formerly appeared to have an uncontested predominance, an additional phanerogamic element, without any direct relationship to the existing Gymnosperms. But the distant alliance of the Dolerophylleæ with the Cordaïteæ, and the relations of the latter to the Cycadeæ, recently demonstrated by M. Renault, show clearly that in the Carboniferous epoch the Dolerophylleæ were related to a whole series of prototypic phanerogams, of which the Sigillariæ must also have formed part.—*Comptes Rendus*, September 9, 1878, p. 393.

*On the Development of the Chilostomatous Bryozoa.*

By M. J. BARROIS.

1. *Formation of the Larva.*—A. After the stage 32 (*blastema* we may distinguish in the ovum four series of cells, viz.:—1. Four central cells of the inferior surface (these are covered by the peripheral cells, and penetrate into the interior to form the endoderm); 2. Twelve peripherals of the inferior surface, which undergo segmentation transversely to form the oral surface; 3. Eight peripherals of the upper surface, which are segmented longitudinally to form the crown; 4. Eight centrals of the upper surface, which are segmented transversely to form the aboral surface.

B. The four endodermic cells increase rapidly, and soon separate into two distinct parts:—1, a full central mass with its cells irregularly arranged; 2, two peripheral series of large regular cells. The former appears to represent the internal lamella; the second the mesoderm.

C. The internal lamella changes into a voluminous mass of nutritive vitellus, which fills the embryo, whilst the series of mesodermic cells diminish until they become almost invisible.

D. While a nutritive vitellus is thus being formed, the exoderm, which seems here to act the part of blastoderm, begins to form the organs of the embryo. The two principal are the *internal sac* (formerly "stomach") and the *piriform organ* (formerly "pharynx"); the former originates by the invagination of the oral surface, the latter by a local hypertrophy of this same surface, perhaps at the level of the mesodermic bands.

E. The rest of the development is occupied by two important processes:—1. The growth of the crown above the aboral surface, dividing this surface into two distinct portions, the *fold* and the *hood*; 2. The separation of the oral surface into two distinct parts,—that which penetrates within the crown and bears the piriform organ (the *notched plate*), and that in the centre of which the internal sac opens (the *rounded plate*); these are separated from each other by a portion of the crown, to which I give the name of the *intermediate lobe*.

2. *Metamorphosis*. A. ESCHARINÆ (*Lepralia ciliata*).—The internal sac devaginates itself and becomes transformed into a plate (*opercular plate*), the lower surface of which serves for fixation. The *rounded plate* which covered this organ sinks down upon itself after its escape and becomes converted into a simple tubular body, which unites the inferior (oral) border of the crown to the middle of the upper surface of the opercular plate. At the same time the crown (containing the notched plate) is observed to turn suddenly and undergo a rotation of 90°, taking its inferior (oral) margin as a fixed point; its upper (aboral) margin describes a semicircle, and thus applies itself against the periphery of the opercular plate. In this movement the crown has carried with it the aboral surface, of which the portion folded back thus becomes visible externally, which from this time constitutes the whole of the external skin, the hood, however, being always distinguishable. At this period the embryo is in the form of a cupule entirely composed of the aboral surface, and having its aperture closed by the opercular plate. The entire crown is contained in this cupule, in the interior of which the vibratile cilia still project; it is contiguous to the whole inner surface of the cupule, and gives origin by its superior (oral) margin to the tubular viscus derived from the rounded plate, which traverses the cavity of the cupule from top to bottom. The lower surface of the opercular plate is destined to unite with the lower margin of the aboral surface to constitute the whole wall of the cell. Its upper surface, on the contrary, unites with the inferior (aboral) margin of the crown in such a manner as to form, with it and the central tubular viscus, a hollow ring, a torus, of the wall of which the notched plate which bears the piriform organ continues to form part. The whole of this ring is destined to degeneration; and it is from it that is derived the thick fatty mass so often described by all authors; nevertheless the notched plate and the piriform organ persist without undergoing this degeneration.

The polypide originates at this period by the invagination of the skin of the hood. In this way is produced an internal sac, which is

nothing but the internal epithelial lamella of the rudiment of the polypide; at the same time the piriform organ is seen to grow and envelop this first part so as to form the external muscular lamella of the same rudiment. Thus we are gradually led to the state of a cell containing a fatty mass and a rudiment of a polypide; the rest of the development is already known.

B. VESICULARÆ (*Serialaria lendigera*).—The notched and rounded plates are seen to bury themselves in the interior and cause fixation; at the same time the two *intermediate lobes*, as well as all the inferior (oral) margin of the crown, close up again above. Thus is produced a first cavity in the form of a double T, wider at the two extremities, which correspond to the sinking of the above-mentioned plates, narrower in the middle, at the level of the two lobes which form two thick projections above them.

Soon after we see the superior (aboral) half of the crown turn so as to surround these two projecting lobes; this turning is not produced by sudden rotation as in the *Escharinæ*, but by devagination like the finger of a glove. Finally there is thus formed a second semicircular cavity, which surrounds the two projecting lobes and is bounded by the superior (aboral) portion of the crown. The aboral surface is, of course, implicated in this movement, and after its closure it forms all the external skin.

At this period the embryo has the form of a rounded sac (the future cell), with an outer skin entirely composed of the aboral surface. Within and in the lower part of this sac there is a compact mass destined to fall into degenerescence, and composed of the long cells of the crown folded three times upon themselves and circumscribing two concentric cavities; this mass fills almost the whole interior; towards the top, however, there exists a cavity which corresponds to the general cavity of the larva, and in which we ought, theoretically, to recognize the *notched* and *rounded plates* with the organs which pertain to them. I have not yet succeeded in recognizing certain traces of the former; but I have often observed in this stage a peculiar mass which may originate from the internal sac.

The rudiment of the polypide seems to me to be formed differently from what we have seen in the *Escharinæ*: there is no invagination of the outer skin; and the internal sac may perhaps act a part in its formation.

C. CELLULARINÆ (*Scrupocellaria scruposa*).—Here we again meet with the same fundamental processes of turning of the crown and formation of the wall of the cell at the expense of the skin of the aboral surface. Attachment takes place by means of a sort of chitinous cupule, which is seen to issue through the aperture leading into the cavity of the turned crown, and which, no doubt, is derived from the secretion of one of the organs of the oral surface.

3. *Conclusions*.—(1) The development of the *Chilostomata* is, on the whole, *meroblastic*; the exoderm gives origin to all the organs, and plays the part of a true blastoderm; true inner lamellæ have only an ephemeral part, and act merely as nutritive vitellus.

(2) Attachment is always effected by the oral pole; and the fundamental fact consists in a turning of the ciliary crown, which, being at first incurved, in the form of a mantle, towards the aboral pole (as in the Cyclostomata), afterwards becomes inflexed towards the oral pole.

(3) The crown constitutes a provisional and essentially larval organ; it is from this that the thick fatty mass so often described in the metamorphosis originates.

(4) The oral and suboral surfaces appear to have each a well-defined part of the highest importance in the embryogeny: the aboral surface represents the cell; the oral surface seems to be destined to play a great part in the formation of the contents of the cell; everywhere we see it penetrate into the interior, wholly or partially, to furnish the rudiments which act in a manner still to be described in the formation of the organs of the adult.—*Comptes Rendus*, September 23, 1878, p. 463.

*Migration of the Aphides of the Galls of the Pistachio to the Roots of Grasses.* By M. J. LICHTENSTEIN.

When I first announced the curious migrations of one of the *Phylloxeræ* of the oak (*P. quercus*, Boyer), from *Quercus coccifera* to *Q. pubescens*, I had the vexation of finding the correctness of my observations doubted by French entomologists; and it was necessary for an Italian naturalist, M. Targioni-Tozzetti, to repeat my experiments upon *Phylloxera florentina*, and establish the fact of the migrations of that species from *Quercus ilex* to *Q. pedunculata*, before the change of *habitat* of the former insect between the second and third larval states was decidedly accepted.

Now I have a still more curious migration to bring before the Academy. The Aphis of the galls of the Pistachio (*Anopleura lentisci*) passes from those galls to the roots of grasses, or, at least, of two species of grasses (*Bromus sterilis* and *Hordeum vulgare*).

On the 12th June last I announced to the French Entomological Society that I had found on the roots of *Bromus sterilis* an Aphis resembling in all points that of the galls of the Pistachio, the characters of which are very strongly marked; for it is the only genus among the Pemphiginæ that carries its wings flat, and the genus has only a single species. But the new comer presented the peculiarity of producing *sexual insects without rostrum*, while that of the galls furnished *larval forms with a rostrum*.

At my suggestion, M. Courchet, a pupil at the School of Pharmacy of Montpellier, has just obtained, in captivity, the breeding of the winged *Anopleura lentisci* upon the young roots of barley sown in a tube; and at the same time I found the same insect at liberty upon the roots of *Bromus sterilis*. These young subterranean wingless forms, produced by the winged aerial form, have already increased in size and are ready to reproduce in their turn.

Applying to the evolution of this insect the theory that I have established with regard to the *Phylloxera quercus*, of the correct-